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BROMIDE MEDICATION PSYCHOLOGICAL ASPECTS OF SODIUM¹

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The study of the effect of drugs on behavior requires psychological as well as physiological observations. Since Loewald's (1) classic experiment in 1896 there have been various studies in which the effects of a drug have been determined in part by psychological methods (2, 3, 4). Recently experiments on animals have been undertaken to supplement the studies in which human subjects have been utilized. Generally in the study of drugs the physician is primarily interested in the physiological effect of medication; the psychological aspects are of only incidental interest. However, medical reports of the effect of drugs usually include some psychological data and often these incidental observations as to a drug's effect on the thinking processes and overt behavior of the patient have furnished significant warning of the harmful effects of certain drugs.

Such observations are at best only casual and the conclusions drawn from them are open to question, since they tend to be based on a limited number of observations.

Sodium bromide has recently received considerable attention. The literature concerning it well illustrates the danger of drawing general conclusions from isolated and casual observations. This drug because of its possible extensive influence on behavior offers particular interest to psychologists. Among the reasons for this may be catalogued the following considerations:

(a) The frequency with which sodium bromide is used. It is reported to be contained in many medicines advertised to the public (5) and in one out of seven physicians' prescriptions for internal use (6).

¹ Manuscript recommended for publication by Dr. J. R. Kantor, March 17, 1942.

(b) The type of patient who resorts to the drug. Bromide is usually prescribed as a sedative (7), hence is most frequently used by the nervous or neurotic, and sometimes by the psychotic patient. This is the type of patient with whom the psychologist most often comes into contact when he is required to evaluate a patient's personality or to give psychotherapy.

(c) The patient's behavior, subsequent to bromide treatment, may present abnormal characteristics which may be due to the effect of bromide (8) or to the basic personality.

The conflicting medical literature raises a number of questions as to the essential effect of sodium bromide medication, that is, whether the drug itself is the cause of abnormal behavior or whether there is an underlying pathological condition which is aggravated and precipitated into an overt form by sodium bromide. It is possible that the undesirable effects attributed to sodium bromide may be a part of the condition for which the drug was prescribed and taken.

The abnormalities reported after bromide medication include a wide variety of manifestations. Of particular interest to the physician are reports of disturbed digestion, skin eruptions, foul breath, alteration of sexual drive and so on (9). The alterations most interesting to the psychologist are those he can actually observe or measure and among them are complaints of aphasia, decreased reaction time, hallucinations, fluctuation of attention, inaccuracy of perception, impairment of memory, disturbed reasoning powers, and the like (10).

At present, these reports make little distinction between the behavior reported in cases of brominism and that seen in other forms of drug intoxication. Moreover, there appears to be no positive evidence that the so-called bromide intoxication may not be an exacerbation of a condition already in progress when treatment was undertaken.

The problem for the psychologist in resolving these difficulties is first to determine the effects of varying amounts of the drug upon the behavior of normal, healthy individuals and upon those suffering from the varied disorders for which bromides are most often used. Only in this way can we distinguish between genuine effects of the drug and abnormalities which may be due to wholly different causes.

Because illness makes the evaluation of observations on bromide therapy more difficult attempts have been made to exclude this factor

in recent studies carried out on an experimental basis. Some workers have used hospital patients but great care has been taken in selecting individuals who are free from mental or organic disease. For example, Barbour (6) used six "recovered" male patients in studying the effect of bromide. Another method has been to use animal subjects in order to control the study more rigorously and to exclude neurological and organic factors. Mason (11) utilized dogs in his study of sodium bromide and its effects on behavior. Another method has been the investigation of psychological aspects of behavior in healthy individuals who have become voluntary subjects for the investigation of the effects of drugs. Loewald (1) described a study made with medical students and physicians as subjects. In this category may be included a report of the effect of sodium bromide upon "involuntary subjects"—individuals in a household who took the drug by accident (9).

Ideally, observations such as those cited should include the following data:

- (1) The amount of sodium bromide taken into the system.
- (2) The amount of sodium bromide accumulated in the system, as indicated by analysis of the blood or cerebrospinal fluid (12).
- (3) The ratio of chlorine to bromine in the system (13).
- (4) Significant alterations in the behavior of the subject occurring simultaneously with and possibly attributable to disturbance of the bromine-chlorine ratio of the body.

Actually, most studies of sodium bromide have failed to correlate the above-mentioned factors, and for this reason they may be considered partially unreliable. Typical studies using humans or dogs have considered the relationship between bromide intake and alteration of behavior, such as that in which Mason observed the behavior of hospital patients and dogs. Both human and animal subjects fasted but received bromide and their usual water intake. The human patients did not appear to be affected by the bromide but there were "individual variations in the blood bromine level" (11). Mason's dogs were kept in metabolism cages and in ten days showed symptoms of intoxication, ataxia and "apparent disorientation". Wolff and Gantt (14) used the Pavlovian technique in observing the condi-

tioned response in two dogs. The effect of sodium bromide was reported to be substantially negative with respect to behavior. As an illustration of the manner in which such studies are carried out, it is interesting to note that two animals were studied with respect to their response to a series of drugs, including caffeine sodiobenzoate, sodium-iso-amylethyl barbiturate, sodium bromide, and chloral hydrate (14).

Since there is a possibility that a drug may accumulate in the system and invalidate subsequent drug studies, care should be exercised to insure that a suitable interval intervene before the same subjects are used a second time. This principle was not observed in several studies of drug action, causing an additional objection to the interpretation of results. One animal investigator studied albino rats in the Skinner conditioning box. He injected various drugs subcutaneously and reported that bromide had no effect on the mean rate of the animals' response. Only four animals were used and a large series of drugs and hormones was employed (15). Another observer used monkeys and found wide individual variations in the animal's response to bromide (16).

Animal studies are useful but they have all the traditional defects of studies of animal behavior. Eventually, the problem of drug therapy resolves itself into a consideration of how a given drug affects human beings, not only in their physiological response but also in their behavior and integrative mental processes. In order to establish our knowledge of the effects of bromide medication on a sound basis we need to augment laboratory and physician's observations by carefully controlled studies of psychological changes in "normal" individuals. It is only in this way that the factors which may be part of the abnormal personality can be excluded and valid assumptions made as to the effect of the drug on normal individuals.

A study of this general nature is Meier's work with epileptic patients under bromide treatment. Six patients were given bromide while two were given no medication and used as controls. Psychological tests were made involving color naming, numeral naming, problems in arithmetic, and memorizing tasks. Meier found in his epileptic subjects general decrease in efficiency and increased sleepiness, a diminished reaction time, poorer performance and perseveration (17). A study of this sort, with healthy subjects, would be of

much more significance. Techniques such as those used by Reifenshein and Davidoff to observe the effects of other drug therapy might well be applied to the study of bromides. They used tests to study continuous addition processes, the Cattell Intelligence Test, the New Stanford Achievement Test, reproduction of card designs, the Kent E.G.Y. Test, and the Rorshach Test (18).

Such tests of the mental achievements of individuals before and after bromide administration would be of definite value in determining whether the drug has any harmful effect upon the higher mental processes and on behavior in general in normal individuals. When we possess information as to the correlation between bromide ingestion and retention and its relation to the chloride content of the body and the nature of the alterations in mental processes and personality, if any, we shall have a sound basis for favoring or rejecting bromide therapy.

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